LMK00306EVM User's Guide

1. General Description

This user guide describes how to set up and operate the LMK00306 evaluation module (EVM). The LMK00306 is a 3-GHz, 6-output differential clock buffer intended for high frequency, low additive jitter clock distribution and level translation. The EVM allows the user to verify the functionality and performance specifications of the device. Refer to the LMK00306 datasheet for the functional description and specifications.

2. Features

- Low-noise clock fan-out via two banks of three differential outputs and one LVCMOS output
- Selectable differential output type (LVPECL, LVDS, HCSL, or Hi-Z)
- 3:1 input multiplexer with two universal input buffers and one crystal oscillator interface
- DIP switch control of device configuration
- 3.3 V core and 3 independent 3.3 V/2.5 V output supplies (one per output bank) using external supply inputs or optional LP3878-ADJ LDO or LMZ10500 switching regulator on board
- AC- or DC-coupled input & output interface with low-skew, controlled-impedance traces and edge SMA connectors

Figure 1: LMK00306EVM Board Photo

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3. Quick Setup

To quickly set up and operate the board with basic equipment, refer to the setup procedure below and test setup shown in Figure 2.

Figure 2: LMK00306 Evaluation Board Quick Start Setup
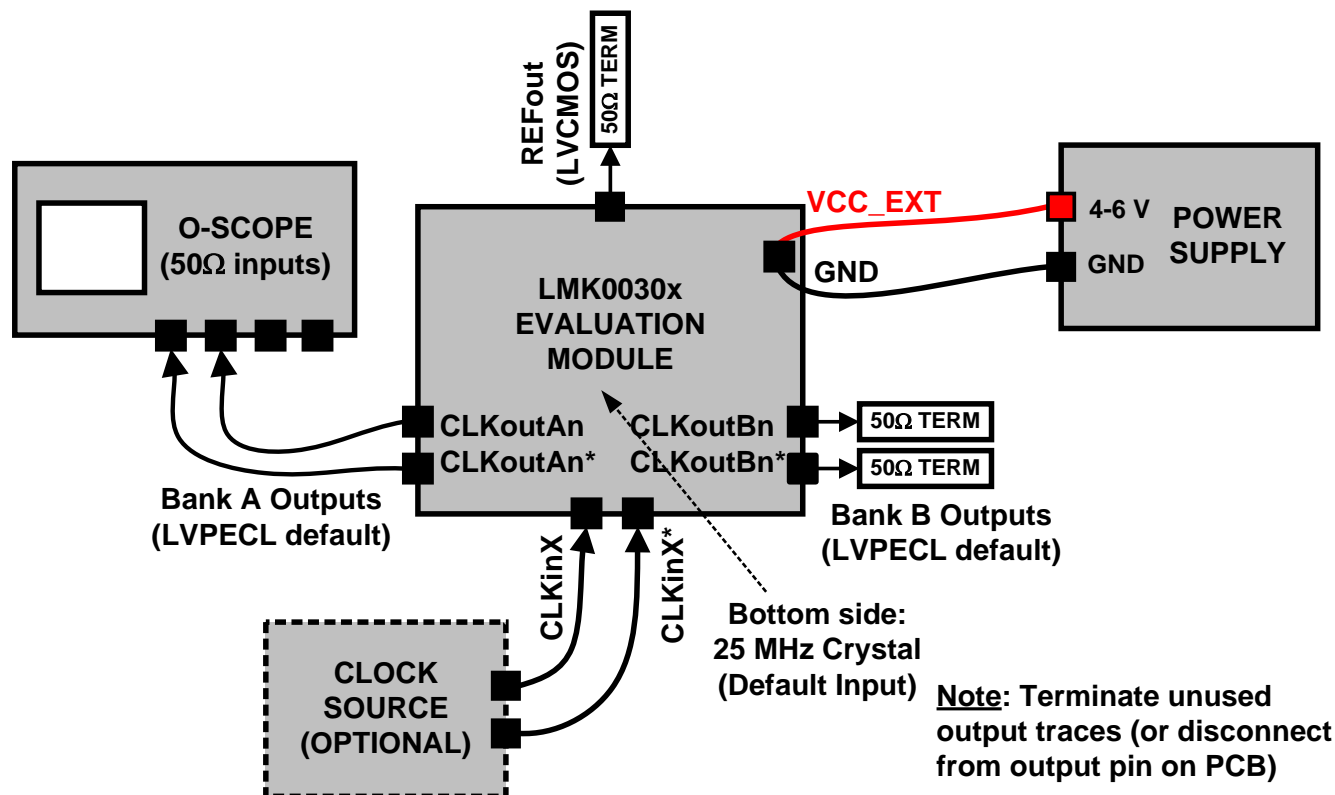
1. Verify the output mode control switches, S1[1:5], match the states shown in Table 1 to reflect the default output clock interfaces configured on the EVM.

Table 1: Default Clock Output Modes

SW Position/Name	SW State	Default Clock Output Modes
S1[1] / CLKoutB_Type1	OFF	Bank B outputs are LVDS
S1[2] / CLKoutB_Type0	ON	
S1[3] / CLKoutB_Type1	OFF	Bank A outputs are LVPECL
S1[4] / CLKoutB_Type0	OFF	
S1[5] / REFout_EN	ON	REFout (CMOS) enabled

2. Connect a 4 – 6 V power supply to VCC_EXT and GND terminals of the power block labeled J2. This powers the on-board LDO regulator to supply 3.3 V to the VCC and VCCO rails of the IC. Both VCC & VCCO status LEDs should be lit green when ON.

3. Set the desired clock input using the input selection control switches, S1[6:7], per Table 2. The onboard 25 MHz crystal (Y1) can be selected, so an external clock source is not required. A differential clock source can be connected to SMAs labeled CLKin0/0* or CLKin1/1*. By default, these differential inputs are AC coupled and terminated near the device with 100 ohms differential. To configure the EVM for a single-ended input, refer to the Clock Inputs section.

Table 2: Input Selection

Selected Input	Default Input Mode	S1[6] CLKin_Sel1 State	S1[7] CLKin_Sel0 State
CLKin0/0*	Differential clock	OFF	OFF
CLKin1/1*	Differential clock	OFF	ON
OSCin	25 MHz XTAL onboard	ON	Don't care

4. Connect and measure any clock output SMA labeled CLKoutA#/A#*, CLKoutB#/B#*, or REFout to an oscilloscope or other test instrument using SMA cable(s). The output clock will be a level-translated/buffered copy of the selected clock input or crystal oscillator. Note: All output clocks are AC-coupled to the SMA connectors to ensure safe use with RF instruments.

Note: Any active output trace(s) without proper load termination can cause signal reflections on the board, which can couple onto nearby outputs and degrade signal quality and measurement accuracy. To minimize these effects, be sure to properly terminate any unused output trace with a 50-ohm SMA load, or else disconnect any unused output trace from the device output pin by removing the series 0-ohm resistor. An unused output or output bank may also be disabled using the output mode control switch.

4. Signal Path and Control Switches

The LMK00306 supports single-ended or differential clocks on CLKin0 and CLKin1. A third input, OSCin, has an integrated crystal oscillator interface that supports a fundamental mode, AT-cut crystal or an external single-ended clock. To achieve the maximum operating frequency and lowest additive jitter, it is recommended to use a differential input clock with high slew rate (>3 V/ns) on either CLKin0 or CLKin1 port.

The device provides up to 6 differential outputs with pin-selectable output mode (LVPECL, LVDS, HCSL, or Hi-Z). An additional output, REFout, has a fixed LVCMOS buffer with output enable input.

All control pins are configured with the control DIP switch, S1. The input selection logic is shown in Table 2. The output mode selection logic for Bank A and Bank B are shown in Table 3 and Table 4. The REFout enable logic is shown in Table 5.

Table 3: Bank A Output Mode Selection

Bank A Output Mode	S1[3] CLKoutA_Type1 State	S1[4] CLKoutA_Type0 State
LVPECL	OFF	OFF
LVDS	OFF	ON
HCSL	ON	OFF
Disabled/Hi-Z	ON	ON

Table 4: Bank B Output Mode Selection

Bank B Output Mode	S1[1] CLKoutB_Type1 State	S1[2] CLKoutB_Type0 State
LVPECL	OFF	OFF
LVDS	OFF	ON
HCSL	ON	OFF
Disabled/Hi-Z	ON	ON

Table 5: REFout Enable Selection

REFout Enable Mode	S1[5] REFout_EN State
Disabled/Hi-Z	OFF
Enabled	ON

5. Power Supplies

The power supply section on the EVM provides flexibility to power the device using the onboard regulator(s) or direct supply input(s). A combination of 0-ohm resistor options allows the user to modify the EVM power supply configuration, if desired.

By default, 3.3 V is supplied to both VCC and VCCO rails by the onboard LDO regulator, U3. To power the regulator, connect a 4 V – 6 V input voltage and ground from an external power source to the terminal block, J2, or SMA input labeled VCC_EXT.

To modify the EVM with a different power supply configuration, populate the resistor options as shown in Table 6. Then, apply the appropriate voltage(s) to the EVM power input(s).

If the EVM is configured for dual direct supplies, connect the 3.3 V supply and ground to VCC_EXT and the 2.5 V supply and ground to the SMA input labeled VCCO_EXT.

Decoupling capacitors and 0-ohm resistor footprints, which can accommodate ferrite beads, can be used to isolate the EVM power input(s) from the device power pins.

Table 6: EVM Power Supply Configuration Options

	LP3878 LDO Regulator (U3) 3.3 V (DEFAULT)	LMZ10500 Switcher (U2) 3.3 V	Single Direct Supply 3.3 V	Dual Direct Supplies 3.3 V & 2.5 V
VCC_EXT port (J2 or SMA)	Apply 4 V – 6 V	Apply 4 V – 5.5 V	Apply 3.3 V ± 5%	Apply 3.3 V ± 5%
VCCO_EXT port (SMA)	Not used	Not used	Not used	Apply 2.5 V ± 5%
U2 Vout	Not used	3.3 V (VCC & VCCO)	Not used	Not used
U3 Vout	3.3 V (VCC & VCCO)	Not used	Not used	Not used
R131	OPEN	OPEN	OPEN	0
R132	0	0	0	0
R134	OPEN	0	OPEN	OPEN
R145	OPEN	0	OPEN	OPEN
R153	OPEN	OPEN	0	0
R155	0	OPEN	OPEN	OPEN
R156	0	OPEN	OPEN	OPEN

5.1. Independent Output Supply Voltages

On the bottom side of the EVM, resistor options provide flexibility to power each of the three individual output supply pins (VCCOA, VCCOB, and VCCOC) from either VCC or VCCO rail. This is useful when 3.3 V and 2.5 V are both needed for separate output supplies.

For example, if Bank A outputs require 3.3 V LVPECL levels, Bank B outputs require 2.5 V LVPECL levels, and REFout requires 2.5 V LVCMOS, then VCCOA can be connected to VCC (3.3 V) and VCCOB and VCCOC can be connected to VCCO (2.5 V).

The EVM power supply needs to be modified to get 2.5 V on the VCCO rail, either using the VCCO_EXT input or LMZ10500 switcher, per Table 6. To configure LMZ10500 with 2.5 V output, set R138 to 150k and R139 to 118k.

Note: When the LMZ10500 switcher is used to power the DUT and an ultra-low-noise clock source is used, the higher output noise voltage of the switcher (compared to the LP3878-ADJ) can cause an slight increase

in the output phase noise floor at low offset frequencies as well as low-level spurs. The high PSRR of the device helps to minimize supply-induced jitter.

6. Clock Inputs

The SMA inputs labeled CLKin0 & CLKin0* and CLKin1 & CLKin1* can be configured to receive a differential clock or single-ended clock. Best performance is achieved with a differential input clock, which is the default configuration for both CLKin ports.

Both CLKin0 and CLKin1 paths include footprint options to provide the user with flexibility in configuring the termination, biasing, and coupling for the device inputs.

6.1. Configuring CLKinX+ for a Single Ended Input

To configure an AC-coupled or DC-coupled single-ended clock input on CLKin0, follow the steps below. CLKin1 can be modified similarly.

1. Remove R24 (100 ohm differential termination).
2. Terminate CLKin0 (driven input) by installing 51 ohms on R30.
3. Install 0.1 uF on C10 as a bypass capacitor.
4. Modify for AC or DC coupled input:
    a. AC-coupled input:
        i. Install 0 ohms on R23, so CLKin0* input pin is AC coupled to ground via C17.
    b. DC-coupled input:
        i. Replace R22 and R28 with 0 ohms to DC couple the input path.
        ii. Bias CLKin0*(non-driven input) with a reference voltage near the common-mode voltage of the DC-coupled input signal (on CLKin0) using R21 and R23 to form a voltage divider from VCC.

For example, if CLKin0 will be driven by a single-ended, DC-coupled LVCMOS signal with a common-mode voltage of 1.65 V, then 1 kohm resistors can be installed on R21 and R23 to bias CLKin0* to VCC/2.

7. Crystal Oscillator Interface

The LMK00306 has an integrated crystal oscillator interface (OSCin/OSCout) that supports a fundamental mode, AT-cut crystal. If the crystal input is selected, the onboard XTAL on either footprint Y1 or Y2 will start-up and the oscillator clock can be measured on any enabled output.

By default, a 25.000 MHz XTAL is populated on Y1, which uses a HC49 footprint on the bottom side of the PCB. Alternatively, a 3.2 x 2.5 mm XTAL or 3.3 V XO (3.3 V CMOS or clipped sinewave) can be populated on Y2, located on the top side. Only one XTAL footprint should be used at a time.

When using a XTAL, the external load capacitor values of C18 and C22 (C_{EXT}) depend on the specified load capacitance (C_L) for the crystal, as well as the device's OSCin input capacitance (C_{IN} = 1 pF typical) and the PCB stray capacitance ($C_{STRAY} \sim 1$ pF). The selected 25 MHz crystal is specified for C_L of 18 pF. Assuming equal external load capacitor values for optimum symmetry, C_{EXT} can be calculated as follows:

$C_{EXT} = (C_L - C_{IN} - C_{STRAY}) * 2$
$C_{EXT} = (18 \text{ pF} - 1 \text{ pF} - 1 \text{ pF}) * 2$
$C_{EXT} \sim 33 \text{ pF (nearest standard value)}$

To limit crystal power dissipation, a 1 kohm resistor is placed between the OSCout pin and the crystal.

7.1. Configuring OSCin for a Single Ended Input

To configure a single-ended clock input on OSCin, remove R34 and R37 to disconnect the crystal. Install 0.1 uF on C24 to provide an AC-coupled path from the SMA input labeled OSCin to the device input, which has internal biasing. Note that the OSCin path includes a 51-ohm termination on R42.

8. Clock Outputs

By default, Bank A outputs are configured for LVPECL mode, source-terminated with 160 ohm resistors, and AC coupled to the SMA connectors labeled CLKoutA#+ / CLKoutA#-. Bank B outputs are configured for LVDS and AC coupled to SMA connectors labeled CLKoutB#+ / CLKoutB#-. To modify the output interface for a different output mode, refer to the modifications noted in the Schematics section.

REFout is a LVCMOS output and is AC coupled to its SMA connector.

As noted before, active output traces should be properly terminated; otherwise any unused output pin can be disconnected from the output trace by removing the 0-ohm series resistor.

8.1. LVPECL and LVCMOS with 2.5 V Vcco

The LVPECL and LVCMOS output levels depend on the output driver's respective Vcco supply as specified in the datasheet.

When an output bank is configured for LVPECL and its Vcco supply is 2.5 V, it is suggested to replace the 160-ohm source-termination resistor to ground with a lower value, such as 91 ohms, to maintain proper DC bias current on each output.
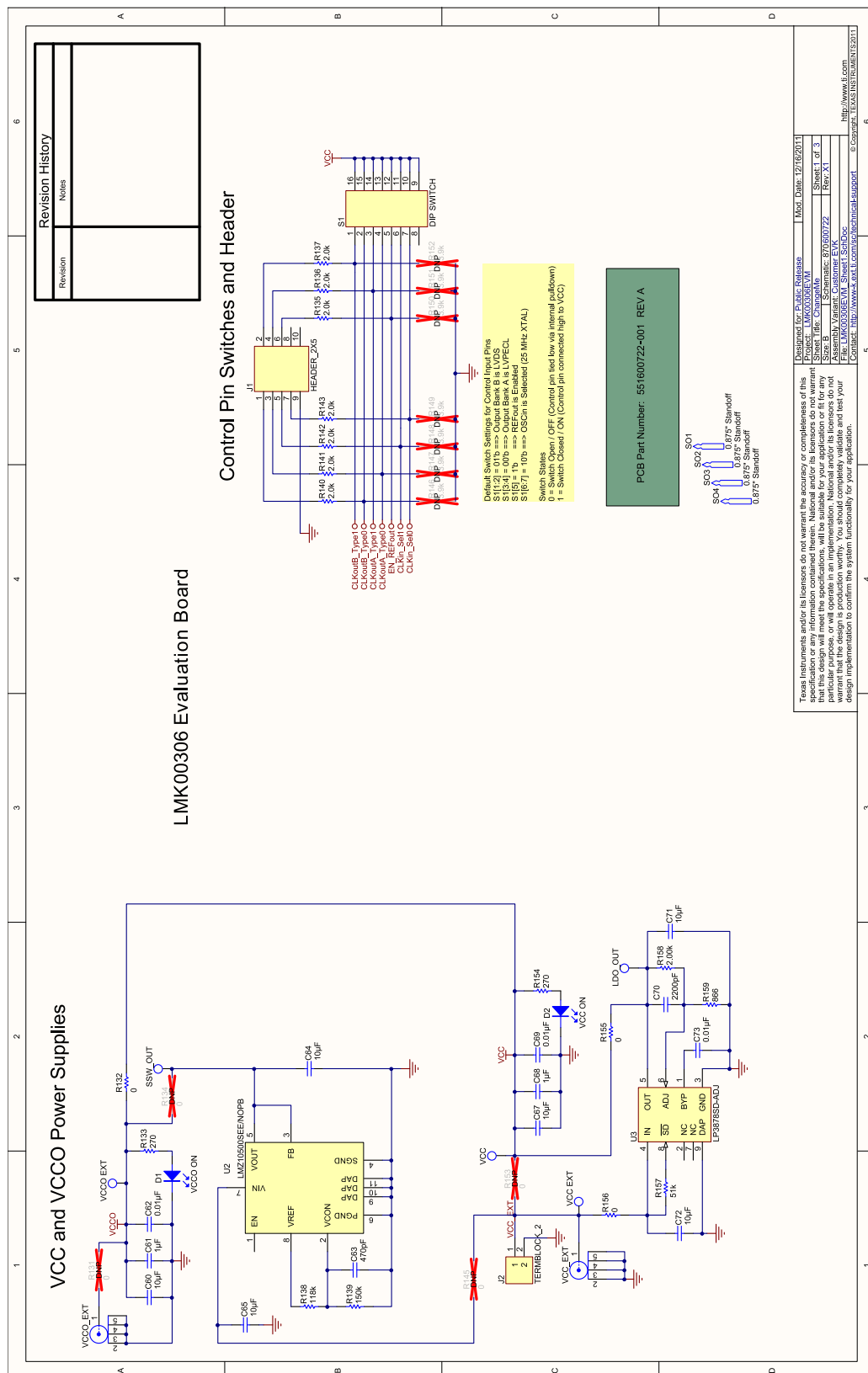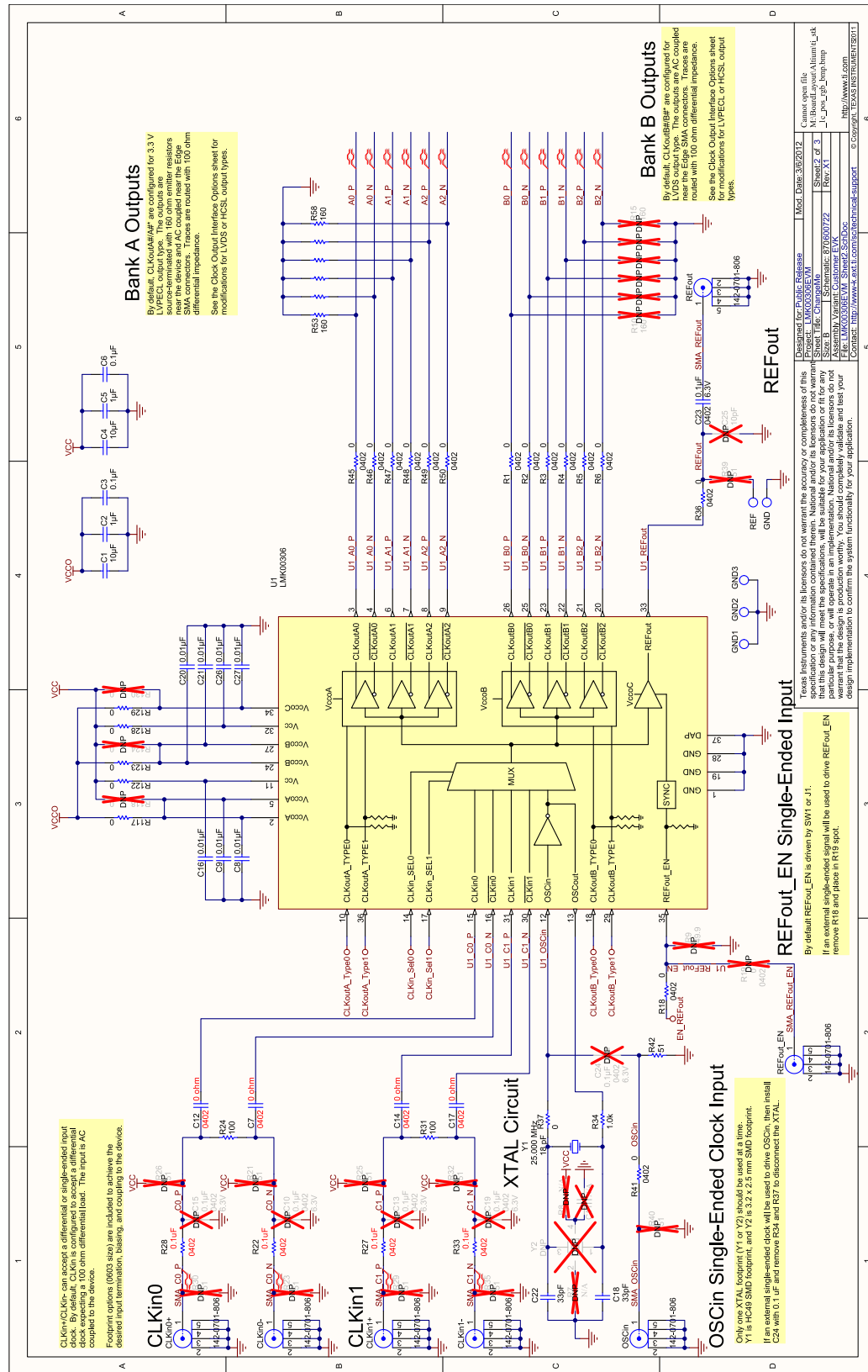
9. Schematics

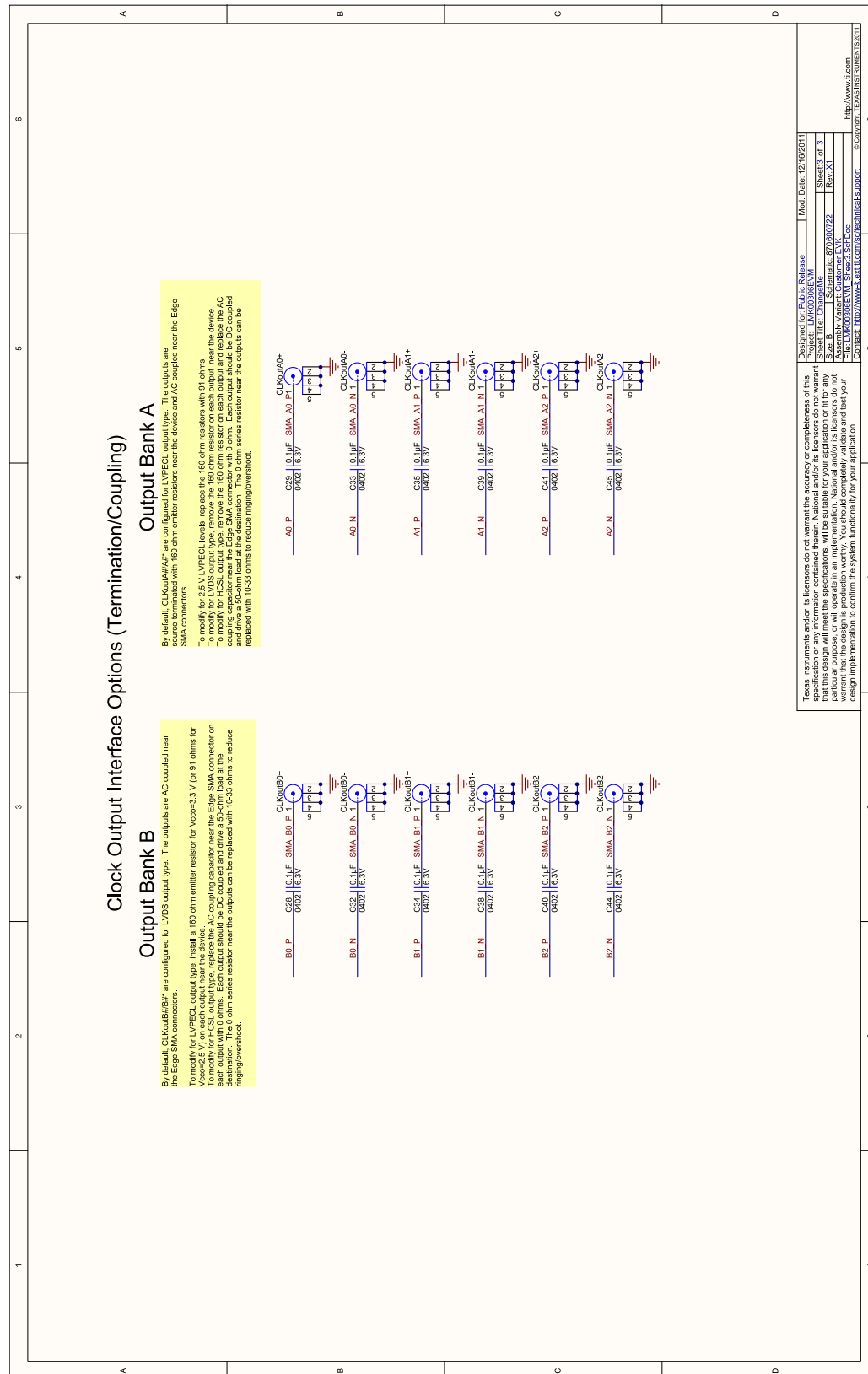
Figure 3: Schematic Sheet #1

Figure 4: Schematic Sheet #2

Clock Output Interface Options (Termination/Coupling)

Output Bank B

By default, CLKoutB#/B#* are configured for LVDS output type. The outputs are AC coupled near the Edge SMA connectors.

To modify for LVPECL output type, install a 160 ohm emitter resistor for Vcco=3.3 V (or 91 ohms for Vcco=2.5 V) on each output near the device.
To modify for HCSL output type, replace the AC coupling capacitor near the Edge SMA connector on each output with 0 ohms. Each output should be DC coupled and drive a 50-ohm load at the destination. The 0 ohm series resistor near the outputs can be replaced with 10-33 ohms to reduce ringing/overshoot.

Output Bank A

By default, CLKoutA#/A#* are configured for LVPECL output type. The outputs are source-terminated with 160 ohm emitter resistors near the device and AC coupled near the Edge SMA connectors.

To modify for 2.5 V LVPECL levels, replace the 160 ohm resistors with 91 ohms.
To modify for LVDS output type, remove the 160 ohm resistor on each output near the device.
To modify for HCSL output type, remove the 160 ohm resistor on each output and replace the AC coupling capacitor near the Edge SMA connector with 0 ohm. Each output should be DC coupled and drive a 50-ohm load at the destination. The 0 ohm series resistor near the outputs can be replaced with 10-33 ohms to reduce ringing/overshoot.

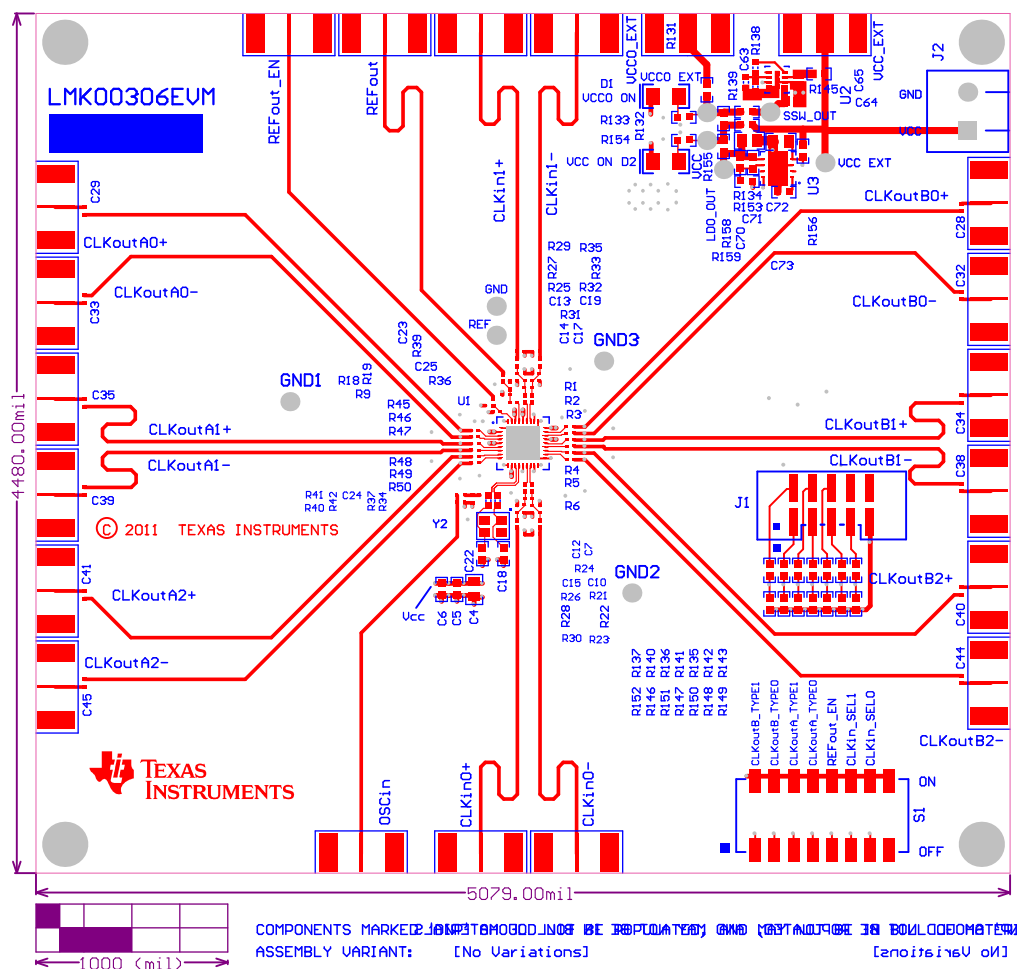**Figure 5: Schematic Sheet #3**

10. Board Layout

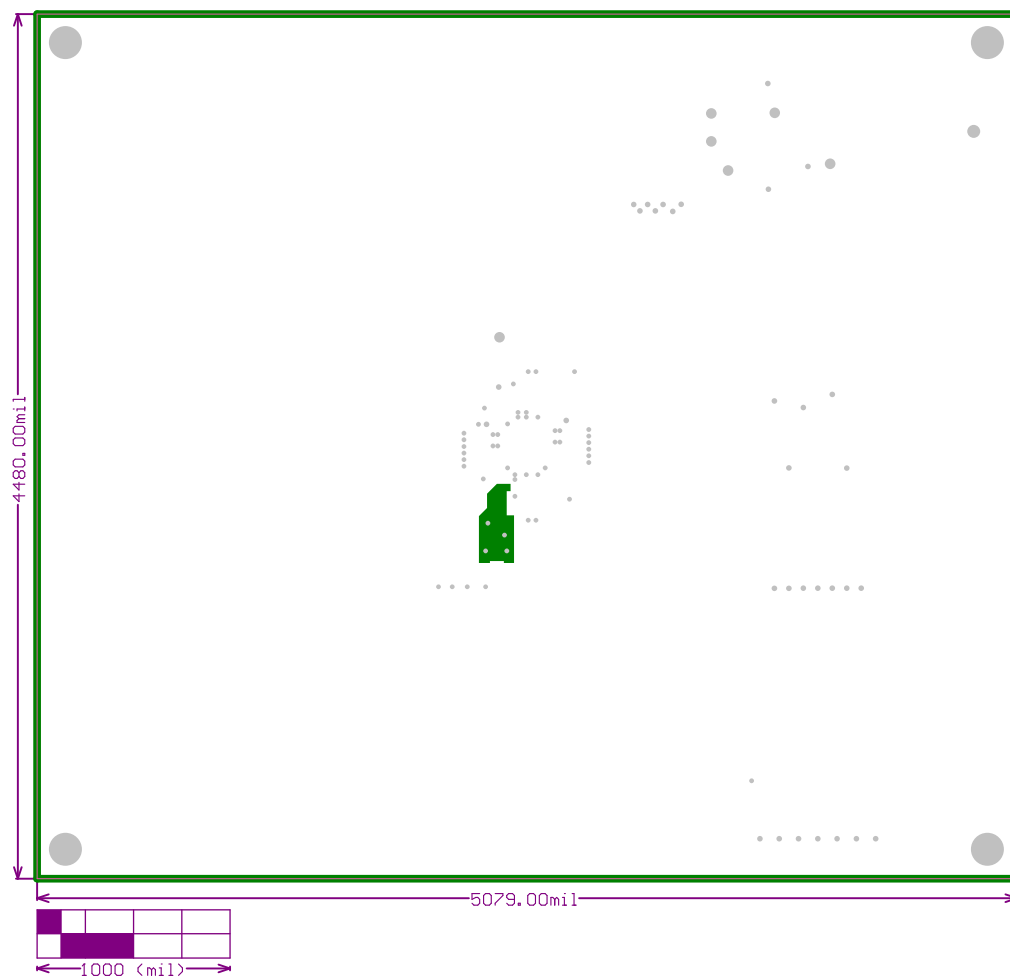**Figure 6: Top Side, Layer #1 (Not to scale)**

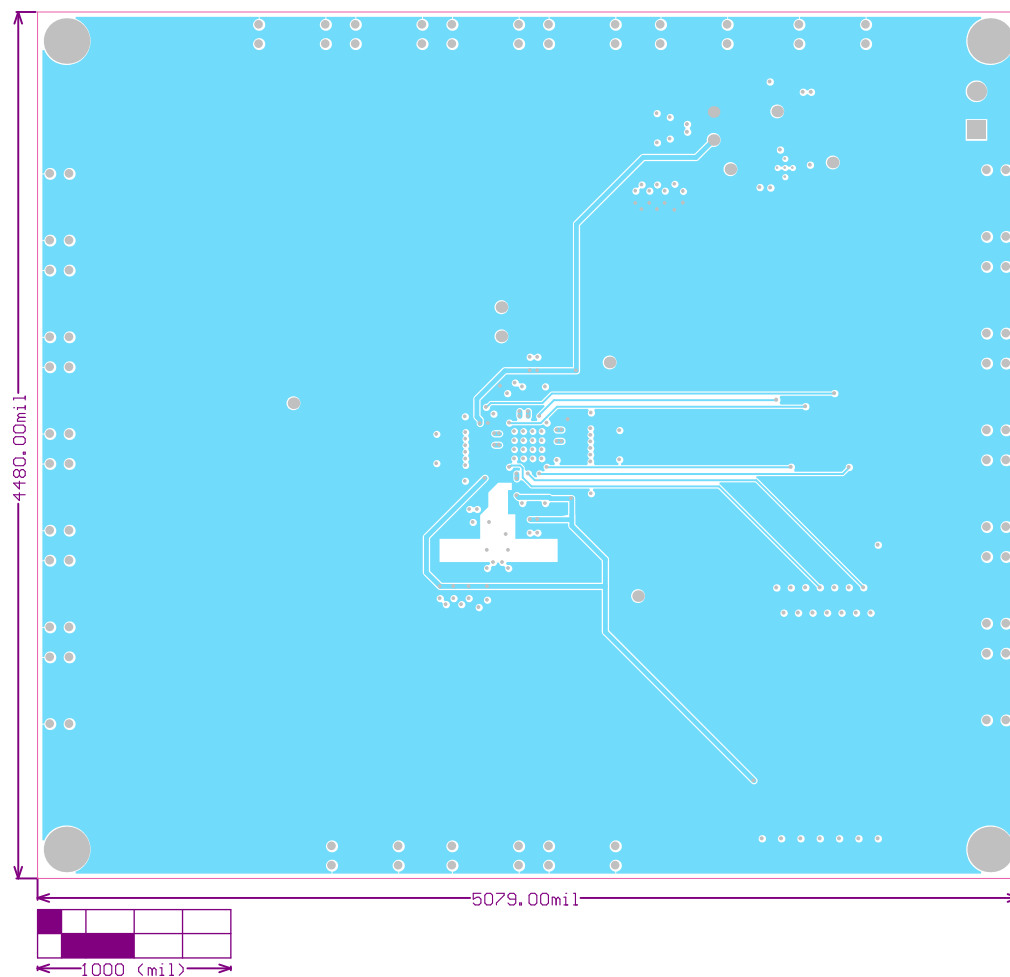**Figure 7: Internal Ground Plane, Layer #2 (Layer Inverted, Not to scale)**

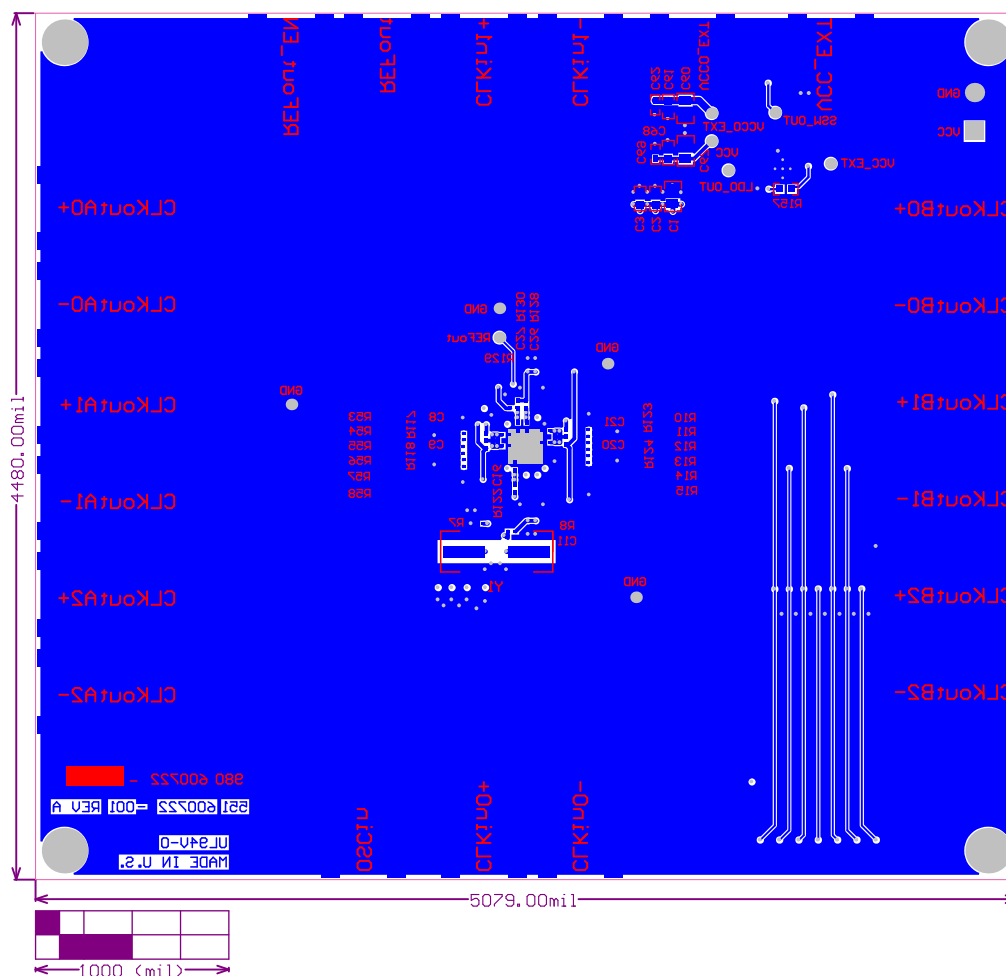**Figure 8: Internal Power Plane, Layer #3 (Not to scale)**

Figure 9: Bottom Side, Layer #4 (Top view, Not to scale)

11. Bill of Materials

#	Designator	Description	Manufacturer	Part Number	Qty
1	AA1	Printed Circuit Board		551600722-001 REV A	1
2	C1, C4, C60, C64, C65, C67, C71, C72	CAP, CERM, 10uF, 10V, +/-10%, X5R, 0805	MuRata	GRM21BR61A106KE19L	8
3	C2, C5, C61, C68	CAP, CERM, 1uF, 16V, +/-10%, X7R, 0603	TDK	C1608X7R1C105K	4
4	C3, C6	CAP, CERM, 0.1uF, 16V, +/-10%, X7R, 0603	TDK	C1608X7R1C104K	2
5	R33, C23, C28, C29, C32, C33, C34, C35, C38, C39, C40, C41, C44, C45, R18, R22, R27, R28	CAP, CERM, 0.1uF, 6.3V, +/-10%, X5R, 0402	TDK	C1005X5R0J104K	17
6	C8, C9, C16, C20, C21, C26, C27, C62, C69	CAP, CERM, 0.01uF, 16V, +/-10%, X7R, 0402	TDK	C1005X7R1C103K	9
7	C18, C22	CAP, CERM, 33pF, 50V, +/-5%, C0G/NP0, 0603	Kemet	C0603C330J5GACTU	2
8	C63	CAP, CERM, 470pF, 50V, +/-10%, X7R, 0603	TDK	C1608X7R1H471K	1
9	C70	CAP, CERM, 2200pF, 100V, +/-5%, X7R, 0603	AVX	06031C222JAT2A	1
10	C73	CAP, CERM, 0.01uF, 25V, +/-5%, C0G/NP0, 0603	TDK	C1608C0G1E103J	1
11	CLKin0+, CLKin0-, CLKin1+, CLKin1-, CLKoutA0+, CLKoutA0-, CLKoutA1+, CLKoutA1-, CLKoutA2+, CLKoutA2-, CLKoutB0+, CLKoutB0-, CLKoutB1+, CLKoutB1-, CLKoutB2+, CLKoutB2-, OSCin, REFout, REFout_EN, VCC_EXT, VCCO_EXT	Connector, SMT, End launch SMA 50 ohm	Emerson Network Power	142-0701-806	21
12	D1, D2	LED 2.8X3.2MM 565NM GRN CLR SMD	Lumex Opto/Components Inc.	SML-LX2832GC	2
13	J1	Low Profile Vertical Header 2x5 0.100"	FCI	52601-G10-8LF	1
14	J2	CONN TERM BLK PCB 5.08MM 2POS OR	Weidmuller	1594540000	1

#	Designator	Description	Manufacturer	Part Number	Qty
15	C7, C12, C14, C17, R1, R2, R3, R4, R5, R6, R36, R41, R45, R46, R47, R48, R49, R50, R117, R122, R123, R128, R129	RES, 0 ohm, 5%, 0.063W, 0402	Panasonic	ERJ-2GE0R00X	24
16	R24, R31	RES, 100 ohm, 1%, 0.063W, 0402	Vishay-Dale	CRCW0402100RFKED	2
17	R34	RES, 1.0k ohm, 5%, 0.1W, 0603	Vishay-Dale	CRCW06031K00JNEA	1
18	R37, R132, R155, R156	RES, 0 ohm, 5%, 0.1W, 0603	Vishay-Dale	CRCW06030000Z0EA	4
19	R42	RES, 51 ohm, 5%, 0.063W, 0402	Vishay-Dale	CRCW040251R0JNED	1
20	R53, R54, R55, R56, R57, R58	RES, 160 ohm, 5%, 0.063W, 0402	Vishay-Dale	CRCW0402160RJNED	6
21	R133, R154	RES, 270 ohm, 5%, 0.1W, 0603	Vishay-Dale	CRCW0603270RJNEA	2
22	R135, R136, R137, R140, R141, R142, R143	RES, 2.0k ohm, 5%, 0.1W, 0603	Vishay-Dale	CRCW06032K00JNEA	7
23	R138	RES, 118k ohm, 1%, 0.1W, 0603	Vishay-Dale	CRCW0603118KFKEA	1
24	R139	RES, 150k ohm, 1%, 0.1W, 0603	Vishay-Dale	CRCW0603150KFKEA	1
25	R157	RES, 51k ohm, 5%, 0.1W, 0603	Vishay-Dale	CRCW060351K0JNEA	1
26	R158	RES, 2.00k ohm, 1%, 0.1W, 0603	Vishay-Dale	CRCW06032K00FKEA	1
27	R159	RES, 866 ohm, 1%, 0.1W, 0603	Vishay-Dale	CRCW0603866RFKEA	1
28	S1	SWITCH DIP ROCKER 8POS SMD	Tyco	GDR08S04	1
29	SO1, SO2, SO3, SO4	0.875" Standoff	VOLTREX	SPCS-14	4
30	U1	High-Performance Differential Fanout Buffer	National Semiconductor	LMK00306	1
31	U2	IC DC-DC NANO MODULE	NSC	LMZ10500SEE/NOPB	1
32	U3	Micropower 800mA Low Noise 'Ceramic Stable' Adjustable Voltage Regulator for 1V to 5V Applications, 8-pin LLP	National Semiconductor	LP3878SD-ADJ	1
33	Y1	CRYSTAL 25.000 MHZ 18PF SMD	Abracon Corporation	ABLS-25.000MHZ-B4-F-T	1
34	C10, C13, C15, C19, C24	DNP			0
35	C11, R7, R8, Y2	DNP			0
36	C25	DNP			0
37	R9	DNP			0
38	R10, R11, R12, R13, R14, R15	DNP			0
39	R19, R118, R124, R130	DNP			0
40	R21, R23, R25, R26, R29, R30, R32, R35, R39, R40	DNP			0
41	R131, R134, R145, R153	DNP			0
42	R146, R147,	DNP			0

#	Designator	Description	Manufacturer	Part Number	Qty
	R148, R149, R150, R151, R152				

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EVALUATION BOARD/KIT/MODULE (EVM) ADDITIONAL TERMS

Texas Instruments (TI) provides the enclosed Evaluation Board/Kit/Module (EVM) under the following conditions:

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/ kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

Please read the User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please visit www.ti.com/esh or contact TI.

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REGULATORY COMPLIANCE INFORMATION

As noted in the EVM User's Guide and/or EVM itself, this EVM and/or accompanying hardware may or may not be subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

For EVMs **not** subject to the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

General Statement for EVMs including a radio

User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this is strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

REGULATORY COMPLIANCE INFORMATION (continued)

FCC Interference Statement for Class B EVM devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concerning EVMs including detachable antennas

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

Concernant les EVMs avec appareils radio

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

【Important Notice for Users of this Product in Japan】

This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。

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EVALUATION BOARD/KIT/MODULE (EVM)
WARNINGS, RESTRICTIONS AND DISCLAIMERS

For Feasibility Evaluation Only, in Laboratory/Development Environments. Unless otherwise indicated, this EVM is not a finished electrical equipment and not intended for consumer use. It is intended solely for use for preliminary feasibility evaluation in laboratory/development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. It should not be used as all or part of a finished end product.

Your Sole Responsibility and Risk. You acknowledge, represent and agree t that :
1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard.
3. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

Certain Instructions, It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, some circuit components may have case temperatures greater than 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

Agreement to Defend, Indemnify and Hold Harmless. You agree to defend, indemnify and hold TI, its licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of or in connection with any use of the EVM that is not in accordance with the terms of the agreement. This obligation shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if the EVM fails to perform as described or expected.

Safety-Critical or Life-Critical Applications. If you intend to evaluate the components for possible use in safety critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, such as devices which are classified as FDA Class III or similar classification, then you must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.

Special Instructions.

NOTES

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